LISTING OF CLAIMS

1. (withdrawn) Apparatus for real-time dynamic analysis of chemical etching of a solid in a liquid etchant, comprising:

an optical element operative to pass a beam of electromagnetic radiation through said liquid etchant at at least two points in time;

a detector operative to perform ex-situ non-contact scanning detection over a predetermined spectral range of said beam of electromagnetic radiation, subsequent to said beam of electromagnetic radiation passing through said liquid etchant at said at least two points in time, so as to detect at least one change in at least one optical property of said liquid etchant; and

a processor operative to compare said at least one change in said at least one optical property of said liquid etchant received from said detector so as to provide a rate of etching of said solid.

2. (withdrawn) Apparatus according to claim 1 and wherein said optical element comprises:

i) an electromagnetic radiation source operative to emit said beam of electromagnetic radiation, and further configured to transmit a reference beam of electromagnetic radiation;

ii) a first optical transmission element operative to transmit said beam of electromagnetic radiation from said electromagnetic radiation source through a sampling element containing a sample of said liquid etchant; and

iii) a second optical transmission element operative to convey said electromagnetic radiation from said sampling element to said detector.

3. (withdrawn) Apparatus according to claim 1, and wherein said processor is further operative to provide a rate of depletion of at least one chemical component of said liquid etchant over a period of time.

4. (withdrawn) Apparatus according to claim 3, and wherein said processor is further

operative to provide a derivative function of said rate of depletion of at least one chemical component of said liquid etchant.

5. (withdrawn) Apparatus according to claim 2, wherein said sampling element comprises a substantially transparent tube.

6. (withdrawn) Apparatus according to claim 5, and wherein said substantially transparent tube comprises a material transparent to said predetermined spectral range.

7. (withdrawn) Apparatus according to claim 6, wherein said material comprises at least one of teflon, glass, polyethylene, polypropylene, PET, polyvinylchloride, nylon, Tygon, polystyrene, silicone rubber PVA, and quartz.

8. (withdrawn) Apparatus according to claim 6, wherein said liquid etchant flows through said substantially transparent tube.

9. (withdrawn) Apparatus according to claim 1, wherein said processor is further configured to convert a change in an optical property of a plurality of chemical components in said liquid etchant into a rate of change of a concentration of at least one of said plurality of chemical components.

10. (withdrawn) Apparatus according to claim 1, wherein said processor is operative to activate an algorithm to perform manipulations on said data using at least one of data: principal component analysis, partial least squares analysis, multiple linear regression analysis and neural network analysis.

11. (withdrawn) Apparatus according to claim 1, further comprising a chemical correction system operative to replenish at least one chemical component in said liquid etchant so as to adjust said rate of etching

12. (withdrawn) Apparatus according to claim 1, wherein said processor is further

operative to perform a chemometric manipulation.

13. (withdrawn) Apparatus according to claim 1, wherein said predetermined spectral range is in a near infrared range (700-2500 nm).

14. (currently amended) A method for real-time dynamic analysis of chemical etching ~~of a solid in a liquid etchant~~, comprising the steps of:

passing electromagnetic radiation from an electromagnetic radiation source through ~~said liquid~~ an aqueous etchant solution comprising at least one inorganic etchant species, at at least two points in time, wherein said ~~liquid~~ aqueous etchant solution is operative to etch ~~said~~ an inorganic solid;

performing ex situ non-contact scanning detection over a predetermined spectral range of said electromagnetic radiation passed through said ~~liquid~~ aqueous etchant solution, by means of a detector over said at least at two points in time so as to detect at least one change in at least one optical property of said ~~liquid~~ aqueous etchant solution over said predetermined spectral range, wherein said aqueous etchant solution further comprises at least one byproduct species produced by the etching of said inorganic solid by said aqueous etchant solution, said at least one byproduct species itself having etchant properties; and

comparing said at least one change in said at least one optical property over said predetermined spectral range at said at least two points in time by means of an algorithm in a processor so as to provide a rate of etching of said inorganic solid, said algorithm being based on a model that takes into account said at least one inorganic etchant species, a plurality of species derived from disassociation of said at least one inorganic etchant species, and said at least one byproduct species having etchant properties.

15. (currently amended) A method according to claim 14, wherein said step of passing includes:

i) emitting electromagnetic radiation in said predetermined spectral range from an electromagnetic radiation source, wherein said electromagnetic radiation is near infrared radiation in the spectral range of 700-1900 nm;

ii) transmitting said <u>near infrared</u> electromagnetic radiation via a first optical transmission element from said <u>near infrared</u> electromagnetic radiation source through a sampling element containing a sample of said ~~liquid~~ <u>aqueous</u> etchant <u>solution comprising at least one inorganic etchant species and at least one byproduct species having etchant properties</u>; and

iii) conveying output <u>near infrared</u> electromagnetic radiation from said sample ~~of said liquid etchant~~ via a second optical transmission element to said detector.

16. (currently amended) A method according to claim 14, wherein said <u>step of</u> comparing further comprises <u>a step of</u> performing a chemometric manipulation on data relating to said at least one change in said at least one optical property <u>over the predetermined spectral range</u>.

17. (currently amended) A method according to claim 14, wherein said algorithm further provides a differential rate of change of said etching of said <u>inorganic</u> solid over a period of time.

18. (currently amended) A method according to claim 14, wherein said algorithm further provides a rate of depletion of at least one chemical component of said ~~liquid~~ <u>aqueous</u> etchant <u>solution</u> over a period of time.

19. (currently amended) A method according to claim 14, wherein said algorithm further provides a rate of etching of said <u>inorganic</u> solid as a function of a concentration of said ~~liquid~~ <u>aqueous</u> etchant <u>solution</u>.

20. (currently amended) A method according to claim 14, wherein said ~~liquid~~ <u>aqueous</u> etchant <u>solution</u> comprises ions selected from the group consisting of halide ions, <u>sulfate</u> ~~sulfuric~~ ions, <u>sulfite</u> ~~sulfurous~~ ions, <u>nitrite</u> ~~nitrous~~ ions, <u>nitrate</u> ~~nitric~~ ions, <u>chromate ions, persulfate ions, phosphate ions</u>, and nitride ions.

21. (currently amended) A method according to claim 14, wherein said step of passing further comprises passing said ~~liquid~~ aqueous etchant solution through a sampling element having a substantially transparent sampling tube.

22. (currently amended) A method according to claim 14, wherein said step of comparing ~~step~~ further comprises a step of converting said at least one change in said at least one optical property of said ~~liquid~~ aqueous etchant solution into a concentration parameter of at least one chemical component of said ~~liquid~~ aqueous etchant solution.

23. (currently amended) A method according to claim 14, wherein said step of comparing ~~step~~ further comprises a step of providing a concentration of at least one chemical component of said ~~liquid~~ aqueous etchant solution.

24. (currently amended) A method according to claim 23, wherein said step of comparing ~~step~~ further comprises a step of supplying a rate of change of a concentration of said at least one chemical component of said aqueous etchant solution.

25. (currently amended) A method according to claim 14, further comprising the steps of:

a) obtaining a plurality of ~~liquid etchant~~ samples of the aqueous etchant solution, wherein each sample ~~of said plurality of liquid etchant samples~~ has a known etch rate;

b) irradiating said plurality of ~~liquid etchant~~ samples of the aqueous etchant solution with NIR and recording their respective spectral scanning transmission intensities over said predetermined spectral range;

c) comparing variations of their respective spectral scanning transmission intensities over said predetermined spectral range so as to correlate spectral transmission of said plurality of samples with said known etch rate, wherein said known etch rate is determined by thickness measurements;

d) developing a calibration model based on the results of step (c); and

e) measuring scanning spectral transmission over said predetermined spectral range of a further ~~liquid~~ aqueous etchant solution sample so as to determine at least one

of an etch rate and a concentration of said further ~~liquid~~ aqueous etchant solution sample based on said calibration model.

26. (currently amended) A method according to claim 14, further comprising a step of detecting a fault in a rate of addition of a replenishing chemical component of said ~~liquid~~ aqueous etchant solution.

27. (currently amended) A method according to claim 14, wherein said step of comparing ~~step~~ further comprises detecting a bubble in said ~~liquid~~ aqueous etchant solution.

28. (currently amended) A method according to claim 14, wherein said step of comparing ~~step~~ further comprises a step of determining a concentration of at least one of a plurality of chemical components in said ~~liquid~~ aqueous etchant solution with a confidence level of more than 95%.

29. (currently amended) A method according to claim 28, wherein said method is independent of a presence of bubbles in said ~~liquid~~ aqueous etchant solution.

30. (currently amended) A method according to claim 28, wherein said method is independent of the temperature of said ~~liquid~~ aqueous etchant solution.

31. (currently amended) A method according to claim 14, further comprising the steps of:

applying computer software to data relating to said at least one change in said at least one optical property so as to provide an updated algorithm; and

applying said updated algorithm to data relating to a new sample of said ~~liquid~~ aqueous etchant solution so as to further provide a rate of etching of said inorganic solid in said new sample.

32. (currently amended) A method according to claim 14, further comprising determining a concentration of at least one of the following: $HF:H_2O$, HF1:5, HF1:50, ~~BOE~~

HF:NH$_4$F, H_2SO_4:HNO_3:HF, ~~EG+HF,~~ Acetic Acid:NH_4F, H_3PO_4:HNO_3:Acetic acid, HNO_3:HF, an inorganic acid, an inorganic base, a commercial oxide etchant, a commercial silicon etchant, a commercial metallic etchant, H_2SO_4:H_2O_2, H_2SO_4:HNO_3 and H_2SO_4:persulfate.

33. (cancelled) ~~A method according to claim 14, wherein said predetermined spectral range is in a near infrared range (700-2500 nm).~~

34. (new) A method according to claim 14, wherein said inorganic solid is a solid containing silicon.

35. (new) A method according to claim 34, wherein said solid containing silicon is selected from a group of solids consisting of Si, SiO_2, and SiN.

36. (new) A method according to claim 14, wherein said model upon which said algorithm is based further takes into account effects of different solution circulation and flow rates.